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Procedures are described in which economies can be effected through careful planning of school buildings and particularly through the consolidation of spaces that are used intermittently throughout the school day. The paper introduces a "use-factor" as a measure, not of the amount of usable space but of the time for which usable space is actually utilized during the school day. Assembly spaces, science rooms, workshops, and circulation spaces are considered with regard to their employment for a multiplicity of purposes. A bibliography listing books concerning multi-purpose rooms is included. (FS)

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A COMPARATIVE STUDY OF MULTI-PURPOSE ROOMS IN EDUCATIONAL BUILDINGS

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PREFACE

This paper has been written to describe ways in which economies can be effected through careful planning of school buildings and particularly through the consolidation of spaces that are used intermittently throughout the school day.

About 241 million extra primary school places have to be provided in Asia before 1980 (1), and this, in turn, will necessitate a big increase in the number of secondary school and teacher training college places provided.

Faced with a programme of such magnitude, no Asian country can afford to waste space in its school buildings. Space costs money. Money saved will enable more buildings to be built.

Some of the richer communities in the world are able to afford a separate space for every school activity - separate gymnasiums, assembly halls and cafeterias, separate workshops for each craft, exhibition halls, play rooms and so on. The fact that these spaces may be unused for much of each day is of no consequence, as sufficient money is available to pay for this scale of accommodation.

Such a state of affairs is unlikely to be encountered in Asian communities. Indeed, in both the temperate and tropical zones, increasing emphasis is being placed on the need to make full use of every unit of area in the school building for teaching throughout the school day and for community use in the evenings and at weekends.

This paper suggests the use of spaces suitable for a multiplicity of purposes, and introduces a "use-factor" as a measure, not of the amount of usable space but of the time for which usable space is actually used during the school day.

In conclusion, lest it be thought that author is preaching to the converted and that this paper is a statement of the obvious, several of the many examples of waste of space here shown are from countries in which universal primary education has not yet been achieved due to the shortage, among other things, of school buildings.

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1. SPACE AND THE SCHOOL DAY

1. EFFICIENT USE OF SPACE

The function of an educational building such as, say, a primary school, is to enclose space so that the curriculum can be most satisfactorily developed. Within the total enclosed space it may be necessary to arrange a series of sub-spaces, each provided for developing a particular part of the curriculum.

The most skilful and economic division into sub-spaces will be that which gives full use of every space for every hour of the school day. Even better will be an arrangement that permits of convenient use by community organizations after the school day is over.

Any space which is not in constant use will involve the wasteful expenditure of capital as well as wasteful recurrent expenditure for maintenance.

Figure 1 indicates a single-storey, two-form West Pakistan primary school, a type commonly found in Asian countries. There are only two rooms in this school and they are in use all day. Such a building is not only highly efficient in its use of space but presents little problem to the designer.

Larger buildings, however, cannot, if they are to be spatially efficient, be designed by the architect alone. If there is to be efficient use of space with resulting reductions in costs, then the educationist must skilfully dovetail the time-tables for each class so that the architect is able to design a building most of the spaces of which can be concurrently occupied. Collaboration between the architect and educationist (forming together a Development Group) is vital. It will inevitably involve compromise - the architect adjusting the plan and the educationist adjusting his requirements in a joint attempt to develop a school that will give efficient use of the space provided.

The development of a schedule of accommodation closely linked with alternative draft time-tables is thus the first stage in the design of an educational building. The process is well described in Building Bulletins Nos. 1 and 17 (2)(3) and in Caudhill (4).

1.2 INEFFICIENT USE OF SPACE

The inefficient use of space is perhaps best described by reference to an example. Figure 2 depicts a six-form, single-storey, primary school. The building contains eleven separate spaces. Assuming the children to be in six groups, at least five of the spaces will be unused at any one time of the day. If physical education takes place in the open, as it does in most Asian countries, at least six spaces, or more than half of the building, will be unused at any one time. Figure 3 indicates several possible uses of the building, all of which indicate a gross waste of space - so gross, in fact, that it would almost be possible to house another school in the same building. The Figure shows the school at six different times of the day, with the parts of the building actually in use coloured black. The problems involved in avoiding gross waste of space are discussed in the following sections, and examples are given of economic

planning achieved throught the use of multi-purpose spaces. There are, however, other factors which militate against the efficient use of space.

1.3 FACTORS TENDING TO PREVENT THE EFFICIENT USE OF SPACE

The need to use space efficiently is so obvious that it might be wondered why the theory differs so often from the practice. What are the barriers to the efficient use of space ?

(a) Community or national pride

Many communities pay for or take part in the construction of their school buildings, of which they are naturally very proud. This pride manifests itself in the desire for larger buildings than can be afforded and also in the desire to retain often out-dated traditional features which, in the community mind, are thought to form an essential part of any school. In many Asian countries, for example, verandahs form a part of the traditional school building but are often unused. In a large primary school programme examined recently, the possibility was demonstrated of building 175 more schools from the savings achieved by reducing the length of the verandah in the original design. Facts of this nature are often very difficult to explain to a community, and the architect and the educationist must be prepared to compromise in matters where local or national traditions are involved. They should never hesitate, however, to emphasize that any savings in building costs could be used to provide more buildings or to buy more books and equipment for the children, for many Asian schools could benefit from improved internal facilities.

(b) Customs or teaching practice

Many teachers of "specialized" subjects would wish, very understandably, to have an entirely separate space in which to teach their subject. It is, in fact, quite common to find separate physics and chemistry laboratories; separate metal and wood workshops and separate assembly halls and gymnasia. It is also unfortunately common to find these spaces unoccupied for substantial portions of the week. The problem of the architect and the educationist is to convince the teachers of these specialized subjects of the need to economize in the use of space. The possibilities afforded by careful design of multi-purpose spaces, such as general laboratories in which the physics and chemistry teachers will both have the facilities they need to teach their respective subjects, should be explained. The metal- and woodwork teachers should be persuaded, through careful and detailed design of facilities to meet their individual requirements, that they can share one large workshop.

(c) Failure of the architect to understand the actual educational needs

American texts (5)(6) give considerable prominence to the selection of a suitable architect. Solutions to the space problem which are in keeping with the overriding need for present day economy must be found, and the architect cannot even attempt to do so without the advice of an educationist.

The need for architect and educationist to work closely together is not generally understood.

The factors tending to prevent the efficient use of space are both real and powerful, and are often ones with which it is possible to sympathize. But they should not be allowed to become the reasons for a form of waste which will deprive more children of a chance of education.

1.4 MEASUREMENT OF THE USE OF SPACE - THE USE-FACTOR

There are several ways of estimating the relative economy of a building. They are :

(a) By comparison between the gross area available for teaching and the remaining area of the school. Table I illustrates such a comparison.

Table I

Accommodation	Area in sq. m.	Percentage of total
Gross teaching area	37,200	57.0
Teaching storage	3,300	4.7
Dining	660	1.0
Pupils' storage	5,360	8.1
Administration	7,480	11.5
Circulation	11,520	17.7
Total	65,520	100.0

Next, one school will be compared with another until an acceptable norm emerges on the basis of which future plans may be judged. Table II illustrates the second stage of the comparison.

Table II

	Percentage of total		
Accommodation	School A	School B	School C
Gross teaching area	57.0	50.5	52.0
Teaching storage	4.7	10.0	8.0
Dining	1.0	2.0	2.0
Pupils' storage	8.1	1.0	1.0
Administration	11.5	17.6	16.8
Circulation	17.7	18.9	20.2
Total	100.0	100.0	100.0

These data for schools (one in the United Kingdom and two in West Pakistan) are useful as indicating the parts of the building on which it might be possible to economize without reducing the gross teaching area. Obviously, the circulation and administration spaces could be examined with a view to effecting economies.

But the data give no indication of the real use to which the teaching accommodation itself is being put. In the case of each of the West Pakistan schools, there are fifteen major spaces in the gross teaching area of which only ten are in use at any one time. In the United Kingdom school, there are nearly forty rooms of which only eighteen are in use at any one time. From this, it might appear that economies would be effected in the gross teaching area, provided suitable time-tables could be prepared to fit the new accommodation schedule.

(b) By comparison of the covered area per pupil considered by function. Table III gives comparative data for three recently constructed teacher training colleges.

Table III

Accommodation	Sq. m./ Student		
	College A	College B	College C
Administration	0.23	0.46	0.48
Gross teaching area	5.20	8.46	7.17
Staff accommodation	0.26	1.31	0.75
Student "	1.43	3.34	2.93
Storage "	0.30	1.29	0.90
Services	0.75	1.36	1.78
Circulation	2.15	1.33	6.05
Miscellaneous	0.52	2.32	-
Total	10.84	19.87	20.06

Again, this sort of table enables the Development Group to pinpoint possible areas in which economies might be effected. In these three cases, student accommodation, gross teaching area and circulation might be investigated.

(c) By study of costs

A comparison of cost per student place is a useful guide once a norm has been established. A comparison of the net costs per unit area of different buildings is also useful. Indeed, most modern design is related to the area per pupil, the cost per place and the cost per unit area of the building (6).

But all of these methods are comparative. None indicates in an absolute way the degree to which the accommodation is used.

To do this it would be necessary to compare the teaching time-table with the plan of the building. From this it would be possible to express the actual use of each unit area of the building in relation to length of the school day during which the building is in use.

Consider the simple single-storey rural classroom and verandah, common in many Asian countries (Figure 4). In a seven-hour teaching day the classroom will be used for six hours (five periods of fifty minutes and two periods of fifty-five minutes) and the verandah used during the breaks for a total of one hour (six breaks of ten minutes).

The area of the verandah is 20 m^2
The area of the classroom is 80 m^2
The use-factor may be defined as the ratio

$$\frac{\text{actual use in } m^2 \text{ hours}}{\text{ideal use in } m^2 \text{ hours}}$$

In this case the actual use is :

Verandah 20 m^2 used for 1 hour	=	20 m^2 hours
Classroom 80 m^2 used for 6 hours	=	480 m^2 hours
Total actual use	=	500 m^2 hours

The ideal use would be of the total area for the total time - that is, 100 m^2 for 7 hours, or 700 m^2 hours.

$$\text{Use-factor (U.F.)} = \frac{500}{700}$$

$$\text{U.F.} = 0.71$$

This represents an absolute statement of the extent to which the building is being used.

But supposing (Figure 5) that a handicrafts room was added to the building in Figure 4 and that this room was in use for 2 hours a day, the use-factor would be:

Verandah	20 m^2 used for 1 hour	=	20 m^2 hours
Classroom	80 m^2 used for 4 hours	=	320 m^2 hours
Handicrafts room	100 m^2 used for 2 hours	=	200 m^2 hours
	Total actual use	=	540 m^2 hours

Total ideal use of the total area for the total time = 200 m^2 for 7 hours, or 1,400 m^2 hours

$$\text{Use-factor} = \frac{540}{1,400}$$

$$\text{U.F.} = 0.39$$

The low use-factor indicates possible inefficient use of space. In the example given, it might be better to increase the classroom area slightly and furnish it as a multi-purpose classroom/handicrafts room.

It should be noted that the use-factor does not reflect the waste in space that might occur if the area allocated per child in the classroom is excessive, and from this point of view it must be regarded with caution. But given close attention to the allocation of area per child, the use-factor is a good guide to the economy of a school building, a low factor indicating a probable lack of co-operation in depth between the architect and the educationist.

1.5 EXAMPLES

Figures 2 and 3 indicate several possible uses of a typical six-form primary school.

If the areas are as follows:

Classrooms (each 35 m^2)	210 m^2
Gymnasium	200 m^2
Assembly hall	350 m^2
Wood workshop	80 m^2
Metal workshop	80 m^2
Home economics room	110 m^2
Circulation and toilets	200 m^2
Total area	1,230 m^2

and if the daily programme of each class is as follows:

Common programme

Assembly Hall: $\frac{1}{2}$ period of assembly daily.

Class programme

Gymnasium	$\frac{1}{2}$ period
Wood or metal workshop	1 period (alternate days)
Home economics room	1 period
Class teaching (history, geography etc.)	4 periods

where each period is of 50 minutes' duration, with 10-minute breaks during which children circulate and use toilets,

then for six classes the total use will be given by

Assembly 350 m^2 x 25 mins.	=	146 m^2 hours
Gymnasium 6(200 m^2 x 25 mins.)	=	500 m^2 hours
Classrooms 4 x 6(35 m^2 x 50 mins.)	=	700 m^2 hours
Wood / metal workshop 6(80 m^2 x 50 mins.)	=	400 m^2 hours
Home economics room 6(110 m^2 x 50 mins.)	=	550 m^2 hours
Circulation and toilets 200 m^2 x 1 hour	=	200 m^2 hours
Total actual use	=	2,496 m^2 hours

Total ideal use of the total area for the total time is 1,230 m^2 for 7 hours = 8,610 m^2 hours.

$$\text{Use-factor} = \frac{2,496}{8,610}$$

$$\underline{\text{U.F.} = 0.29}$$

From this it is clear that the architect and educationist should seek a compromise in accommodation and time-tabling that ensures that the actual use more closely approaches the ideal use.

Figure 6 indicates a possible solution in which total area is reduced by combining the gymnasium and hall, providing a multi-purpose wood/metal workshop instead of two separate workshops, and reducing the number of classrooms to four (two classes always being time-tabled in workshops or home economics rooms). These combinations also permit of a reduction of circulation space.

The areas are now as follows:

Classrooms	140 m^2
Assembly/Gymnasium	350 m^2
Workshop	120 m^2
Home economics room	110 m^2
Circulation and toilets	120 m^2
Total area	840 m^2

If the daily programme of each class is the same, then for 6 classes the use will be given by

Classrooms 4 x 6 (35 m^2 x 50 mins.)	=	467 m^2 hours
Assembly/Gymnasium 6 (350 m^2 x 25 mins.)	=	875 m^2 hours
Assembly (350 m^2 x 25 mins.)	=	146 m^2 hours
Workshop 6 (120 m^2 x 50 mins.)	=	600 m^2 hours
Home economics room 6 (110 m^2 x 50 mins.)	=	550 m^2 hours
Circulation and toilets 12 m^2 x 1 hour	=	120 m^2 hours
Total actual use	=	2,758 m^2 hours

Total ideal use of the total area for the total time is 840 m^2 for 7 hours = 5,880 m^2 hours.

$$\text{Use-factor} = \frac{2,758}{5,880}$$

$$\underline{\text{U.F.} = 0.47}$$

This represents a considerable improvement in use which might perhaps be further improved by reductions in the circulation area.

Six alternative uses of the reduced accommodation are shown in Figure 7.

2. ASSEMBLY HALL

The purpose of this section is to outline briefly the functions and suitable sizes of various spaces in which all the pupils or students may assemble, and to draw certain conclusions from this information about the shape and size of a multi-purpose space within which all of the assembly functions may be fulfilled (7) (8) (9).

2.1 THE AUDITORIUM

An auditorium is commonly used for formal assembly by the whole school, and perhaps for prayers and community functions.

The area allocated per pupil should be about 0.56 m^2 (6 sq. ft.) for seating, and to this should be added about 30 m^2 (275 sq. ft.) for a raised platform. A store for stacking chairs should also be provided.

2.2 THE CANTEEN

Separate canteens will normally be provided in those cases only where pupils are in residence. The boarders may be assumed to take each meal in two sittings, 50% of them sitting on each occasion. An area of 0.90 m^2 (9 sq. ft.) should be provided per pupil. Kitchen accommodation must, of course, also be provided.

2.3 THE GYMNASIUM

The gymnasium is essentially a product of educational building in temperate climates where weather conditions are usually such as to preclude programmed physical education in the open. In humid tropical countries, where the weather is more predictable and there are long sunny periods or at worst cloudy periods without rain, physical education may more easily be programmed as an outdoor activity. The use of a covered space will thus be needed only in an emergency, or in crowded urban areas where no outdoor space is available. In both of these cases use can be made of the auditorium. A minimum full-size gymnasium should be 18 m. x 9 m. (about 60 ft. x 30 ft.). Dressing rooms are needed, and these can be grouped together with the normal school toilet accommodation.

2.4 THE COMMUNITY MEETING ROOM

The community may wish to use the assembly space for meetings, entertainments (involving refreshments and use of the kitchen) and games, and for other social events.

A six-class school of 210 pupils will be drawn from a community of about 1,100 persons (10) (11), and for such a community seating could be provided for about 240 persons on about the same scale as recommended in 2.1 above.

2.5 THE MULTI-PURPOSE ASSEMBLY SPACE

A single space that is to contain the activities listed in 2.1, 2.2, 2.4 and part of 2.3 above will thus have the following characteristics:

Area for 210 pupils (240 community seats) = about 150 m^2 (1,620 sq. ft.), with dining in two shifts. The length should be from $1\frac{1}{2}$ to $1\frac{1}{4}$ times the width, while the width should be from about $\sqrt{2/3 \times \text{area}}$ to $\sqrt{4/5 \times \text{area}}$. For this particular space a width of from 10 to 11 m., a length of from 16.5 to 15 m. and a corresponding area of 165 m^2 will be appropriate. A square space is more flexible in use than a long rectangular one.

In primary schools no provision should be made for a separate assembly hall, but moveable partitions should be used between three classrooms, which could then be used for this purpose (Figure 8).

2.6 EXAMPLES

Figure 9 illustrates alternative uses of the multi-purpose space. Figures 10 to 14 inclusive are examples of good multi-purpose assembly rooms from both the tropical Asian and temperate regions. A commentary is given below each example.

3. SCIENCE ROOMS

As in section 2, the characteristic requirements of the spaces required for science teaching are discussed and a multi-purpose room suitable to meet these combined requirements described (11) (12) (13) (14).

3.1 LABORATORIES

(a) General

All laboratories should be planned with

(i) A demonstration bench for the teacher
(ii) A seating area for the class watching a demonstration or taking part in a discussion
(iii) An area for experiment
(iv) Storage.

The area provided for (i), (ii) and (iv) should, for a class of 30, be about 65 m^2 (710 sq. ft.) (Figure 15a). A simpler solution is to use laboratory benches as desks, and this is proposed, in (12), with a gross area of 104 m^2 (1,120 sq. ft.) (Figure 15b) excluding storage. If this arrangement is accepted, special care must be taken to ensure comfortable seating and a good view by each pupil of the demonstration bench.

(b) Chemistry

Provision of about 2.8 m^2 (30 sq. ft.) per pupil is suggested for the experimental area of the laboratory. A bench length of 0.70 m. (2 ft. 3 in.) should also be provided for each pupil. For a class of 35, the experimental area should be about 100 m^2 (1,080 sq. ft.).

(c) Physics

Greater flexibility is possible in a physics laboratory than in a chemistry laboratory. The space requirements are similar, but there is a need for work benches with wide, unobstructed, flat tops.

(d) Biology

Similar in size to (b) and (c), but located with direct access to a garden.

3.2 MULTI-PURPOSE SCIENCE ROOMS

From the space point of view, physics, chemistry, biology and general science can all be taught within 160 m^2 (1,750 sq. ft.) excluding storage. However, if this solution is accepted, the closest attention will have to be paid to details such as bench design and storage. A possible arrangement is shown in Figure 16.

In countries not manufacturing science teaching equipment and not wishing to purchase equipment from overseas, there is a case for a science laboratory/workshop combination, with the pupils making some of their own equipment. Indeed, in any country there is much to be said for the sense of true experiment created through the actual construction of equipment for an experiment by the pupils themselves. In that case a combined space of about 300 m^2 for a "science workshop" should be provided.

3.3 EXAMPLES

Figure 17 shows an example of a multi-purpose science room from a Pakistan school, and Figure 18 shows a science workshop from a United States school.

4. WORKSHOPS

Many primary schools include in their curriculum a subject variously called handicrafts, practical work or even woodwork. Schools in areas where the children live in an agricultural environment often place more stress on practical work than do similar urban schools. Secondary schools and teacher-training colleges may tend to greater practical specialization and include metalwork and woodwork as separate subjects in their work programmes. This section examines the space requirements for several crafts and suggests the use of multi-purpose craftrooms.

4.1 METAL WORKSHOPS

The principal difference between metal workshops and wood workshops is in the size and construction of the benches at which the students work. The metal workshop requires a minimum of about 3.8 m^2 (40 sq. ft.) per pupil and a minimum width of about 8 m. (24 ft.). It should be located at ground level with direct access to the open air so that machinery and heavy items of equipment such as anvils can be brought into the shop without difficulty. Location on the ground floor will also obviate the necessity of having to design heavily reinforced upper floors.

4.2 WOOD WORKSHOPS

In general, larger pieces of material are handled in the wood workshops than in the metal workshops and a slightly larger area of about 4.6 m^2 (50 sq. ft.) per pupil is recommended. This will allow for handling areas in front of and behind wood cutting machines such as saws and planers. Wood workshops should similarly be located at ground level and the connexion between shop and store carefully designed to allow easy movement of long pieces of timber.

4.3 MULTI-PURPOSE CRAFT ROOM

The handicraft room is a well-known example of a multi-purpose room and is regularly found in schedules of accommodation of primary and other schools. It normally contains simple wood and metal-working equipment but may provide for other branches of craft work such as leatherwork, weaving etc. 3.8 m^2 (40 sq. ft.) per pupil is regarded as adequate provision for primary schools. About 28 m^2 (300 sq. ft.) should be provided for storage. In secondary schools, about 185 m^2 (2,000 sq. ft.) would be adequate for a combined metal and wood workshop for 30 students. A possible arrangement of benches and equipment in a combined workshop of this kind is given in Figure 19.

4.4 EXAMPLES

Figure 20 shows two arrangements suitable for handicrafts. The buildings are those used in the Philippines and are known as "industrial arts" buildings. They are interesting examples of simple provision for multiple craft teaching.

5. CIRCULATION

In hot humid climates the need to achieve thermal comfort and freedom from noise leads to the design of "lineal" or "finger" schools with lengthy circulation paths. This section considers the character of these circulation spaces and the possibilities of either using them for other purposes or integrating them in existing accommodation.

5.1 FUNCTION OF CIRCULATION SPACE

A circulation space is an area protected from the sun and rain (but often open at the sides) along which the children and staff of the school may move between the different units of accommodation. From a strictly theoretical viewpoint the circulation

corridor need only be wide enough to accommodate the number of people moving in it, and there should be no corridor where there is no possibility of circulation. Recommended widths for children moving along corridors are:

Number of children	Units	130	145	165	180	195
Width of	m.	1.00	1.25	1.40	1.50	1.75
corridor	ft.	3'6"	4'0"	4'6"	5'0"	5'6"

In the humid tropics there can be little use for circulation space when climate statistics indicate that rainfall during schoolhours is unlikely. Such circulation space as is provided will receive most use in the brief period at the end of each lesson - probably not more than one hour of total use a day in most schools.

Circulation space with one open side should not be thought of as costing less per unit area than a classroom, for it is invariably paved and covered with roofing material and sometimes partially enclosed by walls. For this reason circulation should, if possible, always be integrated with other spaces.

5.2 THE INEFFICIENT USE OF CIRCULATION SPACE

There are several classic examples of the inefficient use of circulation space which recur time and again. They are worthy of mention, and are shown in Figure 21. The examples have been taken from schools in the Asian region, although they are commonly found in schools of all regions.

5.3 EFFICIENT CIRCULATION

Efficient circulation will, wherever possible, be inside the teaching accommodation rather than outside; where circulation space is provided outside the main building, it will not be covered when rain during schoolhours is unusual; it will always lead from door to door and go no further than is necessary; where wide corridors are considered essential for some special reason, other uses should be planned for the corridors (for private study groups, dining, practical work spaces, exhibition spaces etc.).

Figure 10 gives some examples of the efficient use of circulation space.

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(12) Palmer, R.R.,and Rice, W.M. Laboratories and classrooms for high school physics. New York, Educational Facilities Laboratories, 1961. (Case Study, No. 3).

(13) Transvaal, South Africa. School Buildings Committee. Planning of classrooms for high schools. Pretoria, SA Government Printer, 1958.

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Résumé

L'objet de ce document est de proposer des solutions économiques pour la construction de locaux à usage multiple dans les bâtiments scolaires.

La figure 1 montre une petite école avec deux salles de classe constamment utilisées. Mais dans des écoles plus grandes, comme celles des figures 2 et 3, plusieurs locaux sont utilisés de manière très irrégulière. Ce gaspillage peut être dû à l'amour-propre des autorités responsables de la construction, aux traditions d'enseignement (le professeur de chaque spécialité veut avoir une salle particulière) ou à l'incompréhension des facteurs pédagogiques de la part de l'architecte.

La bonne utilisation des locaux peut être mesurée a) par une comparaison entre la surface destinée à l'enseignement et celle qui est réservée à d'autres usages, b) par une comparaison entre les surfaces par élève pour chaque fonction, et c) par une étude des coûts par élève. Différents exemples chiffrés illustrent ces indications.

La deuxième partie de l'étude est consacrée aux fonctions et aux dimensions des principaux locaux où se rassemblent les élèves, afin de parvenir à des conclusions sur la forme et la dimension d'un local à usage multiple dans lequel différentes activités pourront avoir lieu. Locaux examinés : l'auditorium, la cantine, la salle de gymnastique, la salle de réunion commune, les salles de sciences et de travaux manuels, l'espace réservé à la circulation.

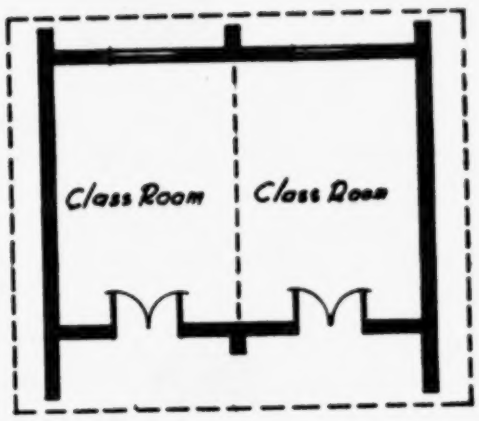


FIGURE 1

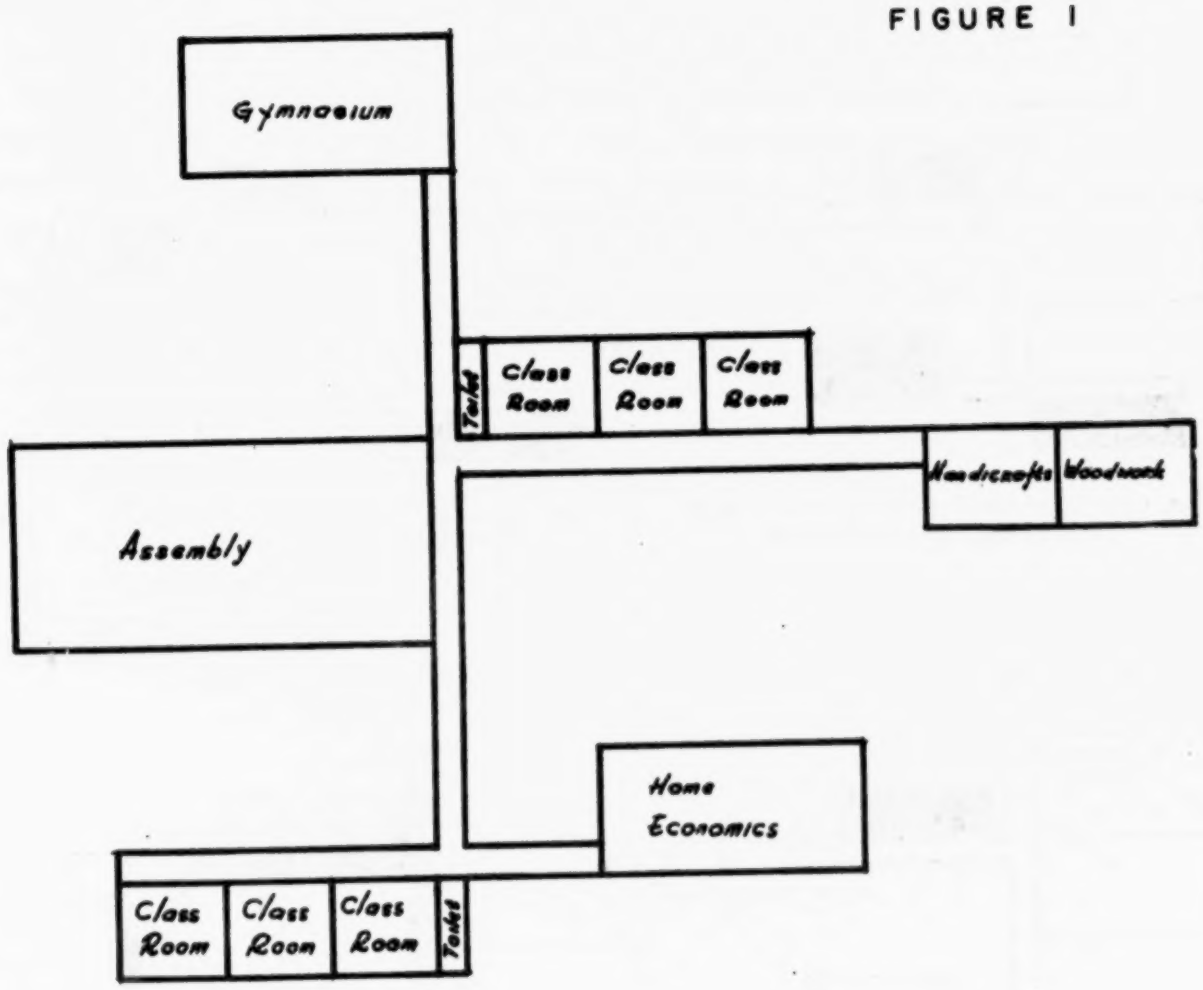
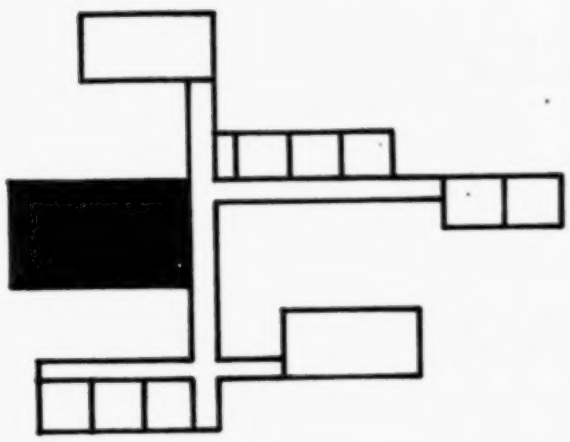
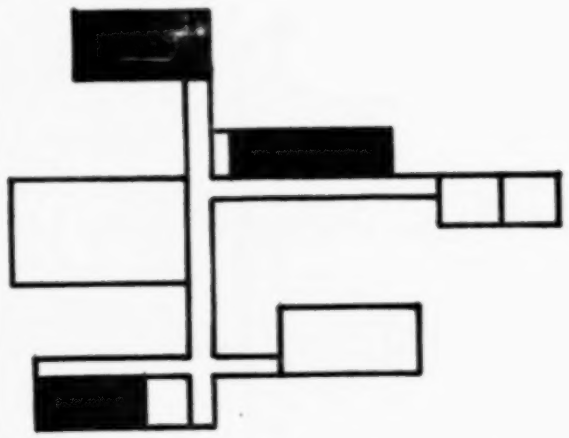


FIGURE 2

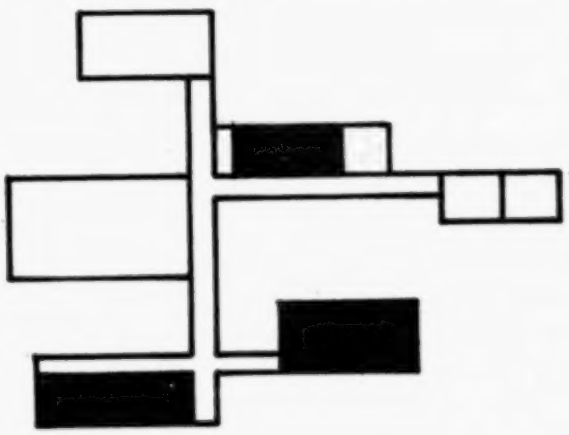
GROSS WASTE OF SPACE - parts of the building in use at any onetime are shewn in black - compare with figure 7



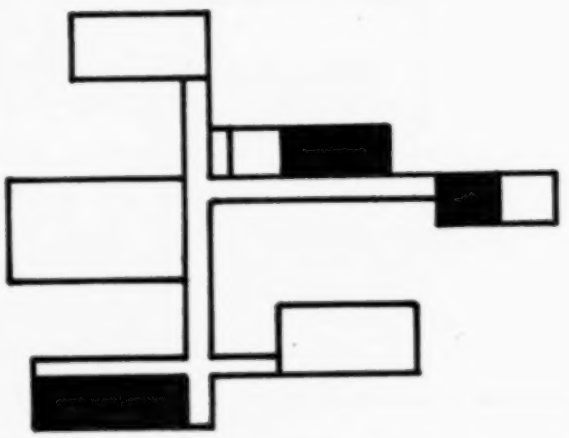
during early morning assembly



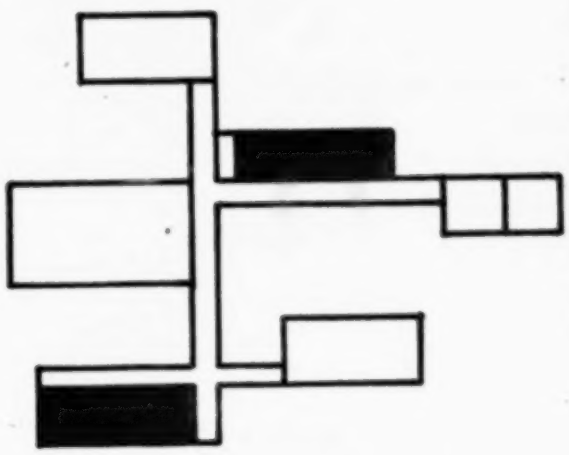
one class in gymnasium - other classes in classrooms



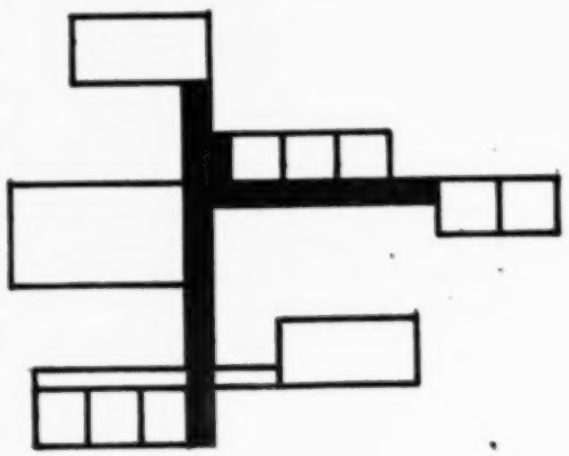
one class in home economics - other classes in classrooms



one class in handicrafts - other classes in classrooms



all classes in classrooms



break times

FIGURE 3

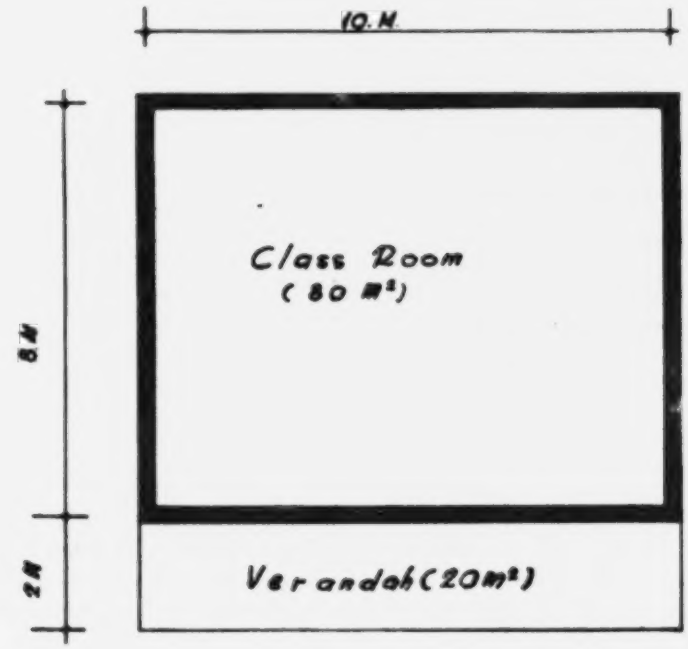


FIGURE 4

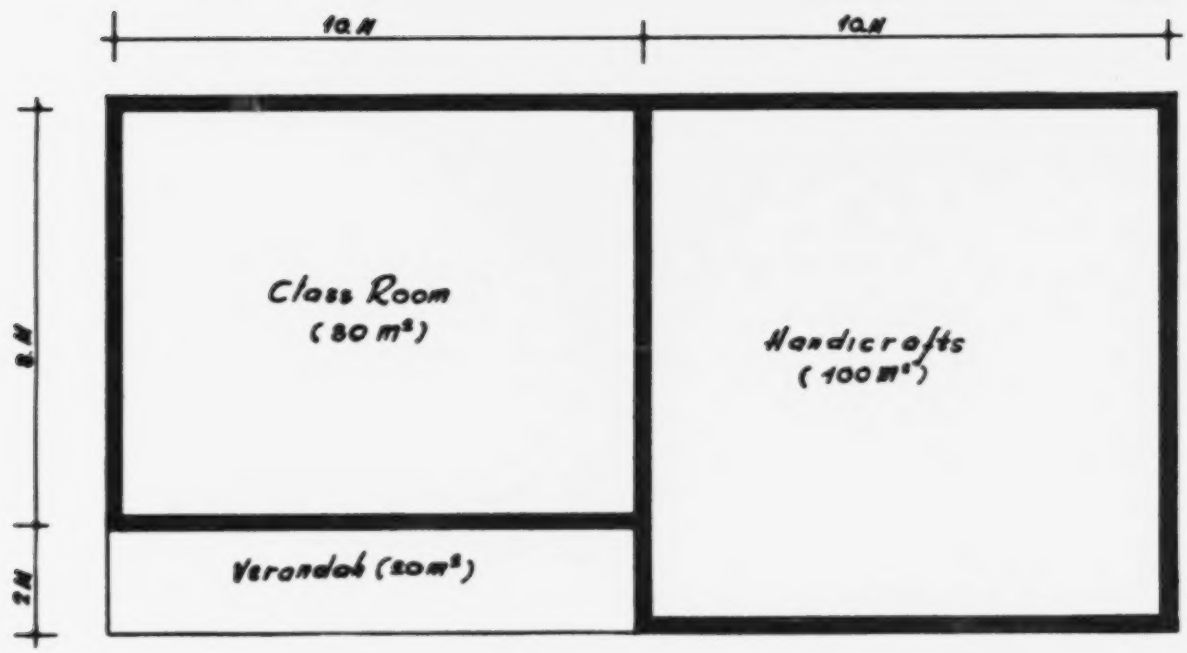


FIGURE 5

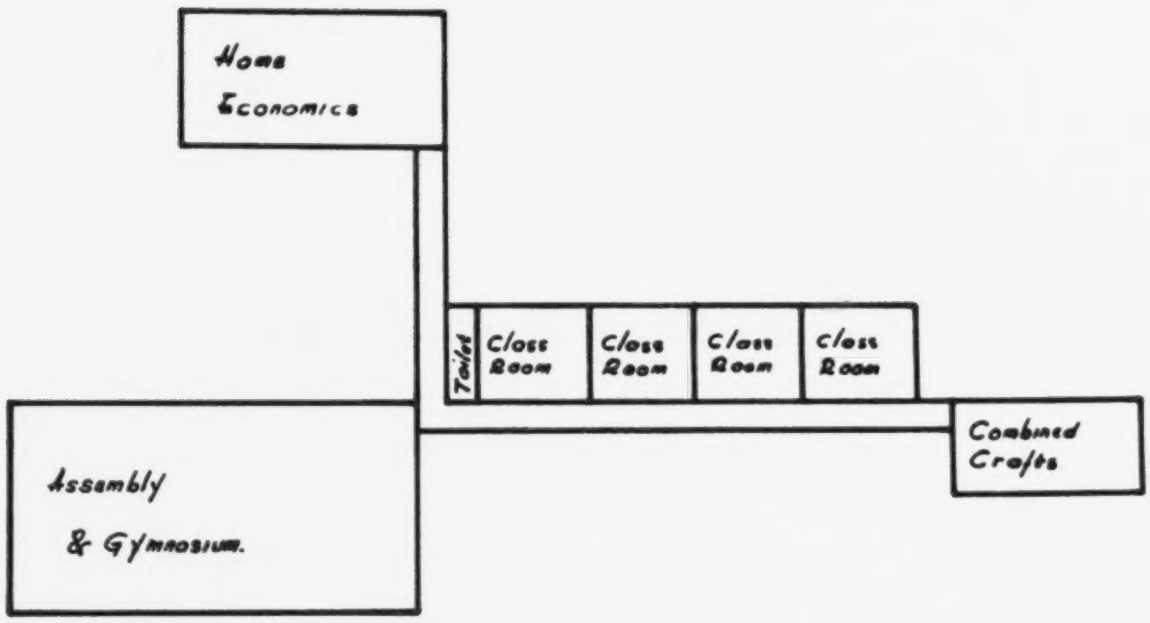
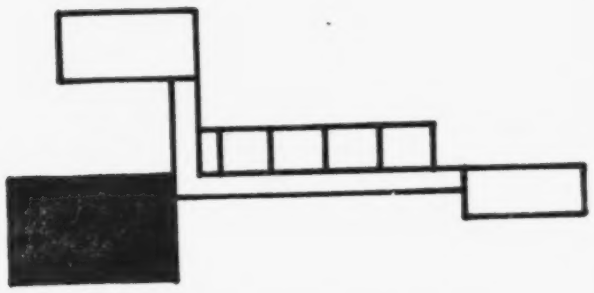
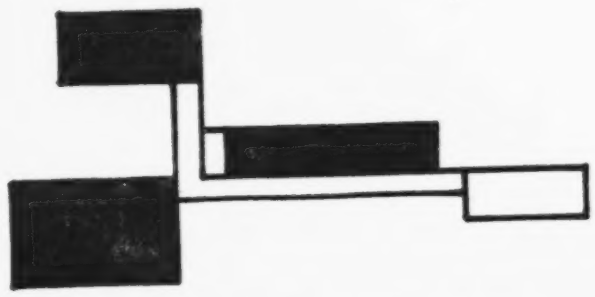

Home
Economics
Toilet
Class
Room
Class
Room
Class
Room
Class
Room
Combined
Crafts
Assembly
& Gymnasium.

FIGURE 6

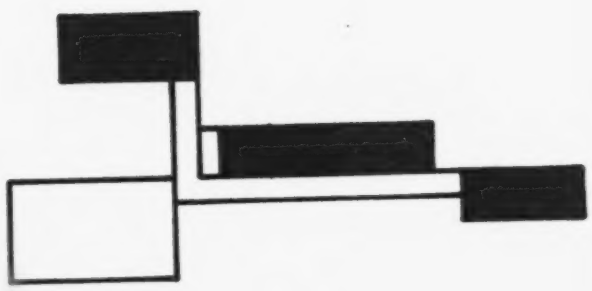
MORE SENSIBLE USE OF SPACE - compare with figure 3



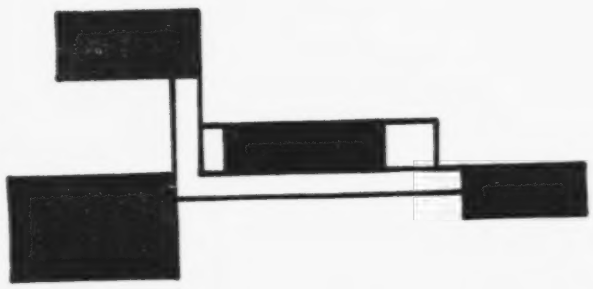
during early morning assembly



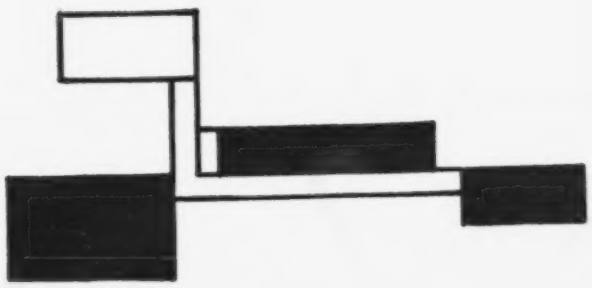
one class in gymnasium; one class in home economics other classes in classrooms



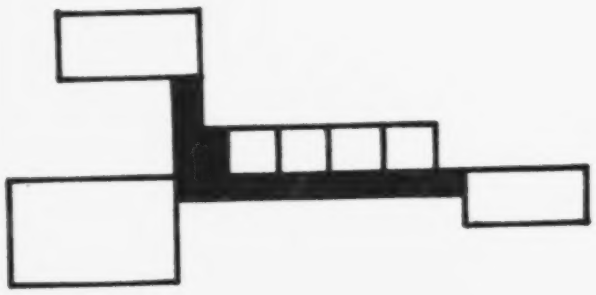
one class in home economics; one class in workshop; four classes in classrooms



one class in handicrafts; one class in gymnasium; three classes in classroom; one class in home economics



one class in assembly-hall (singing, dancing); one class in workshop; four classes in classrooms



break times

FIGURE. 7.

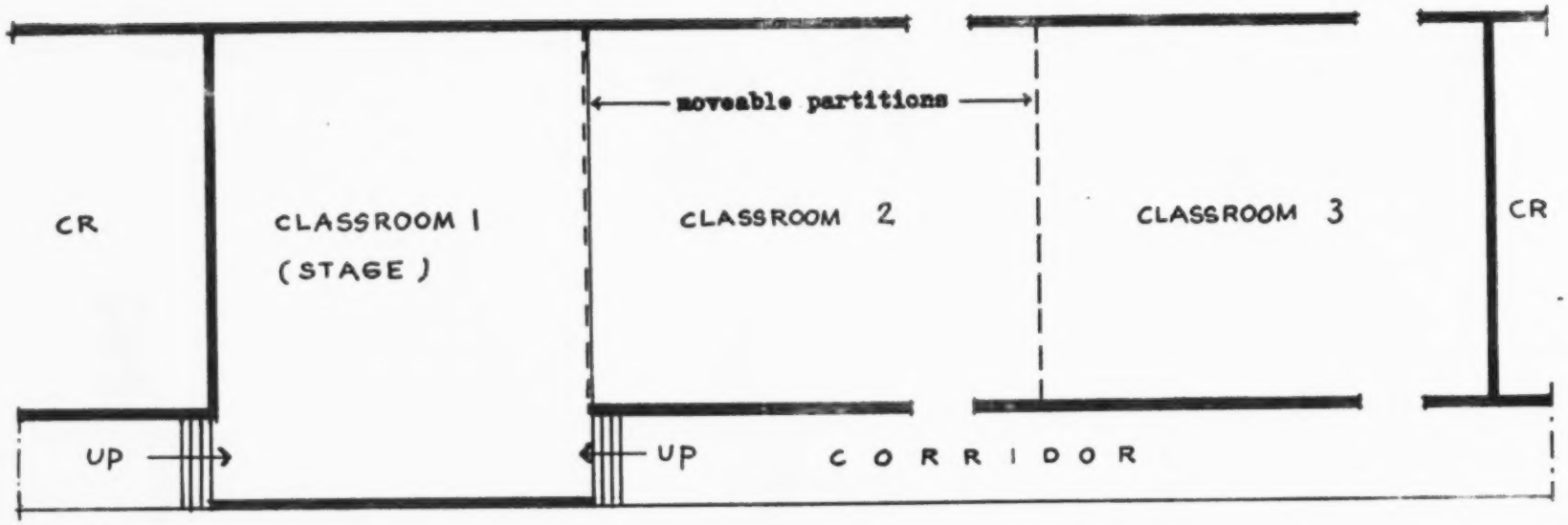
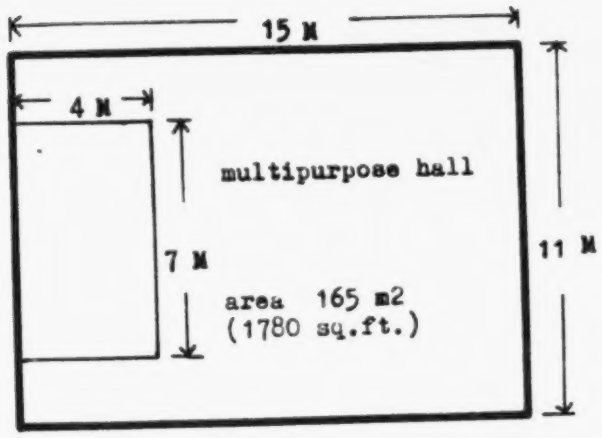


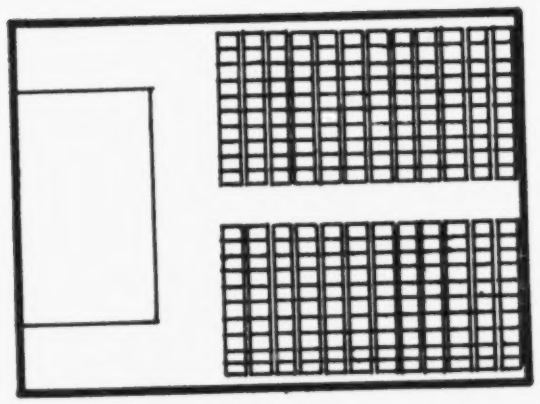
FIGURE 8

When moveable screens are opened classrooms 2 & 3 form a hall and classroom 1, which is at a higher level, forms a raised stage - a good example of multi-purpose use from a primary school at Pangandaran, West Java - Indonesia.

A.

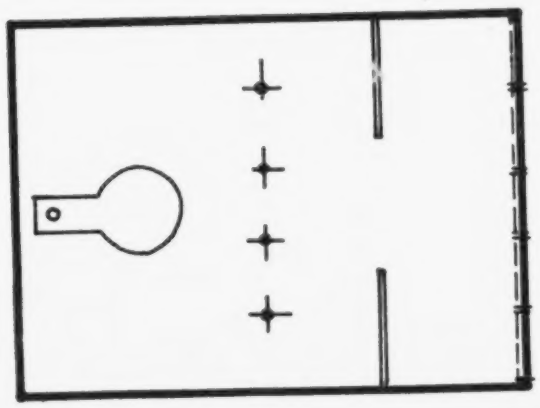


B.



space for 240 seats (school or community use)

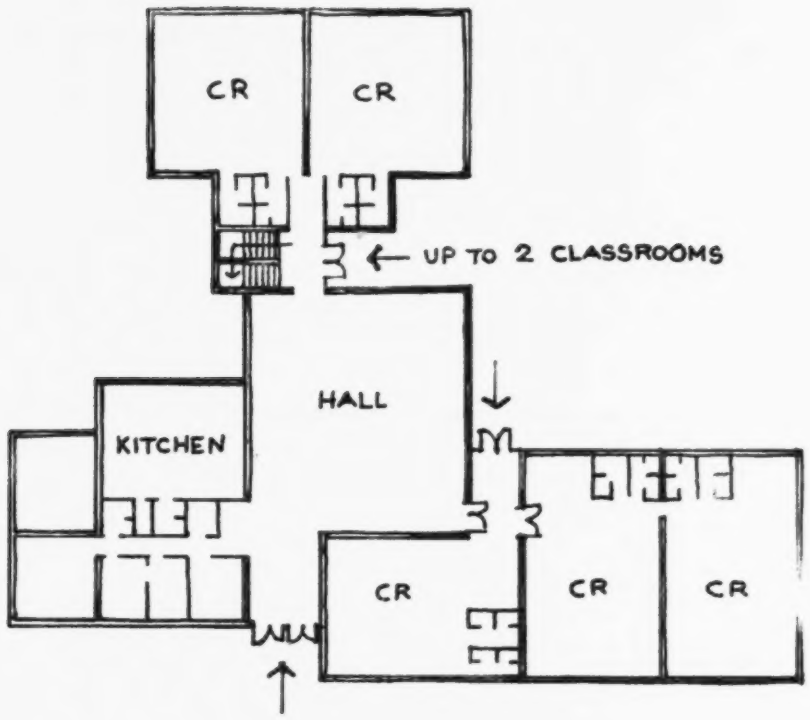
C.



use as a gymnasium

ARRANGEMENTS - MULTIPURPOSE HALLS

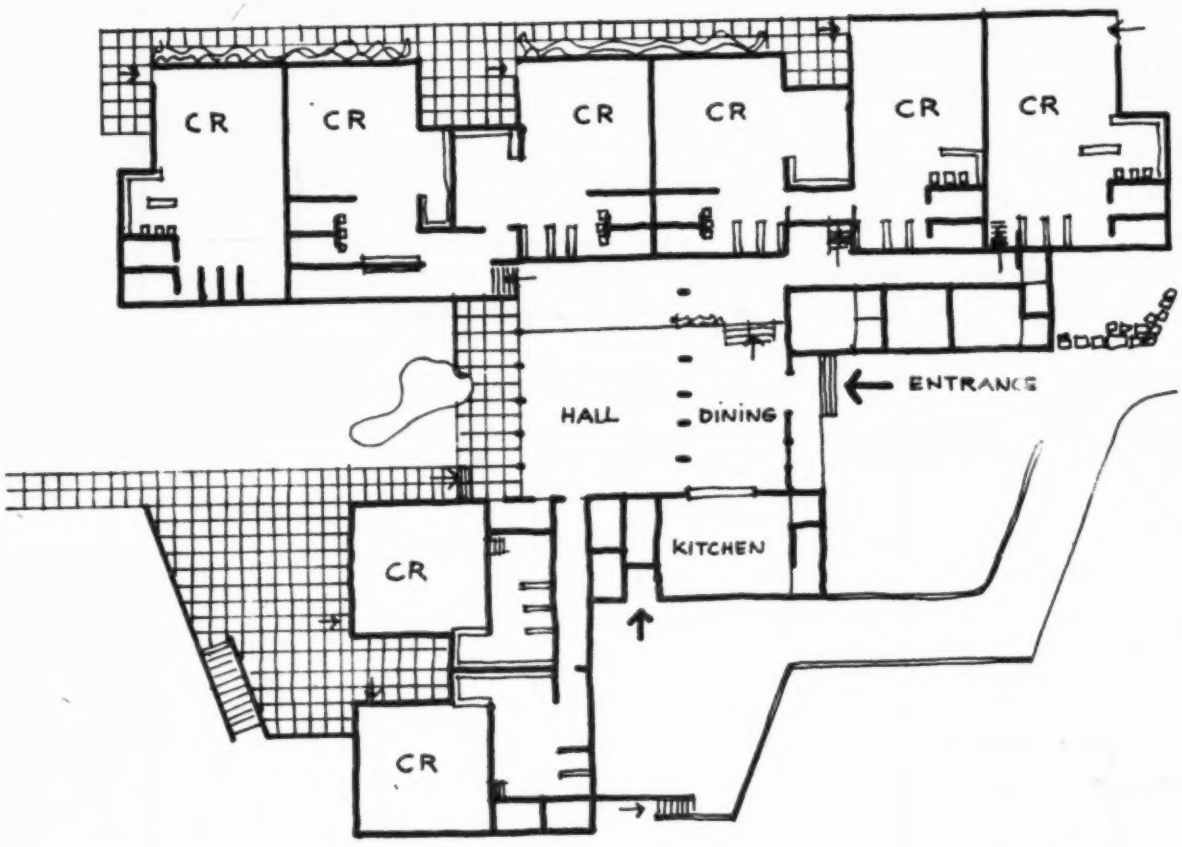
FIGURE 9



Typical primary school plans in which the hall serves for a gymnasium, cafetaria and assembly space. It also serves as a "sixth" classroom for class singing, dancing and drama and as a gymnasium & community hall.

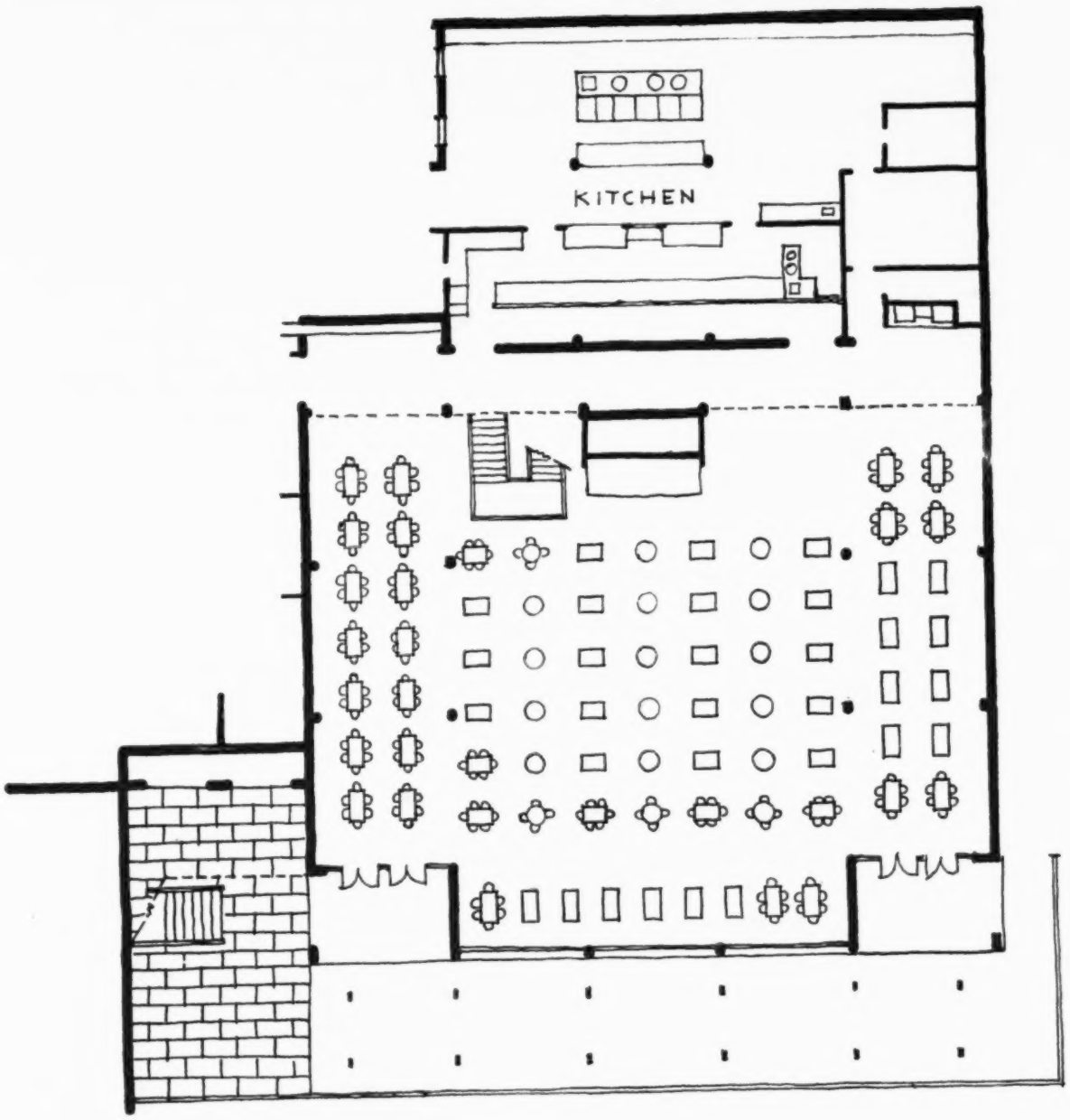
Note there is practically no circulation space. These buildings have a high use factor.

FIGURE 10



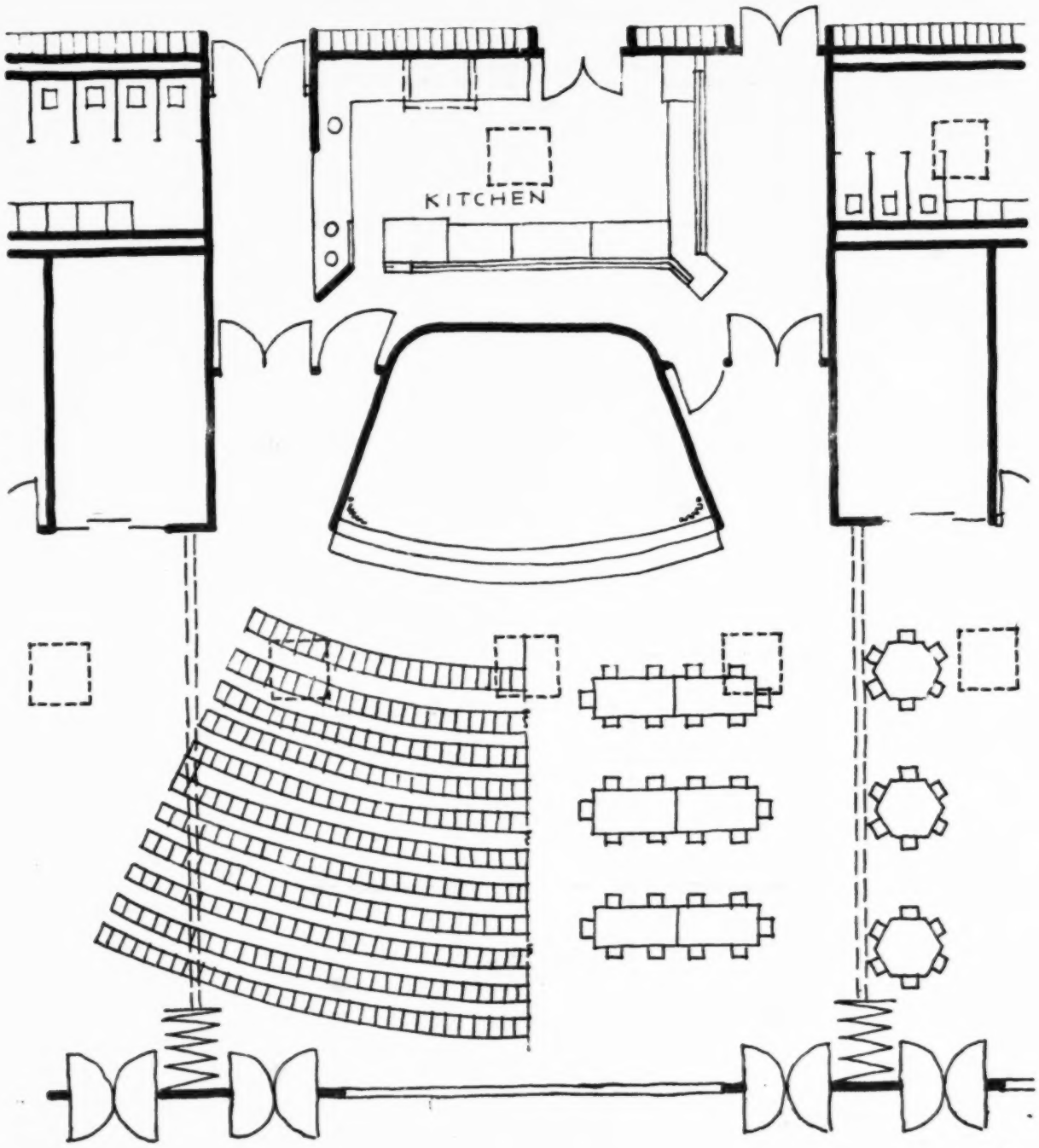
Hackenthorpe School, U.K., with combined assembly and dining space, used also for physical education, drama and music. Note use of hall as entrance and general circulation space.

FIGURE 11



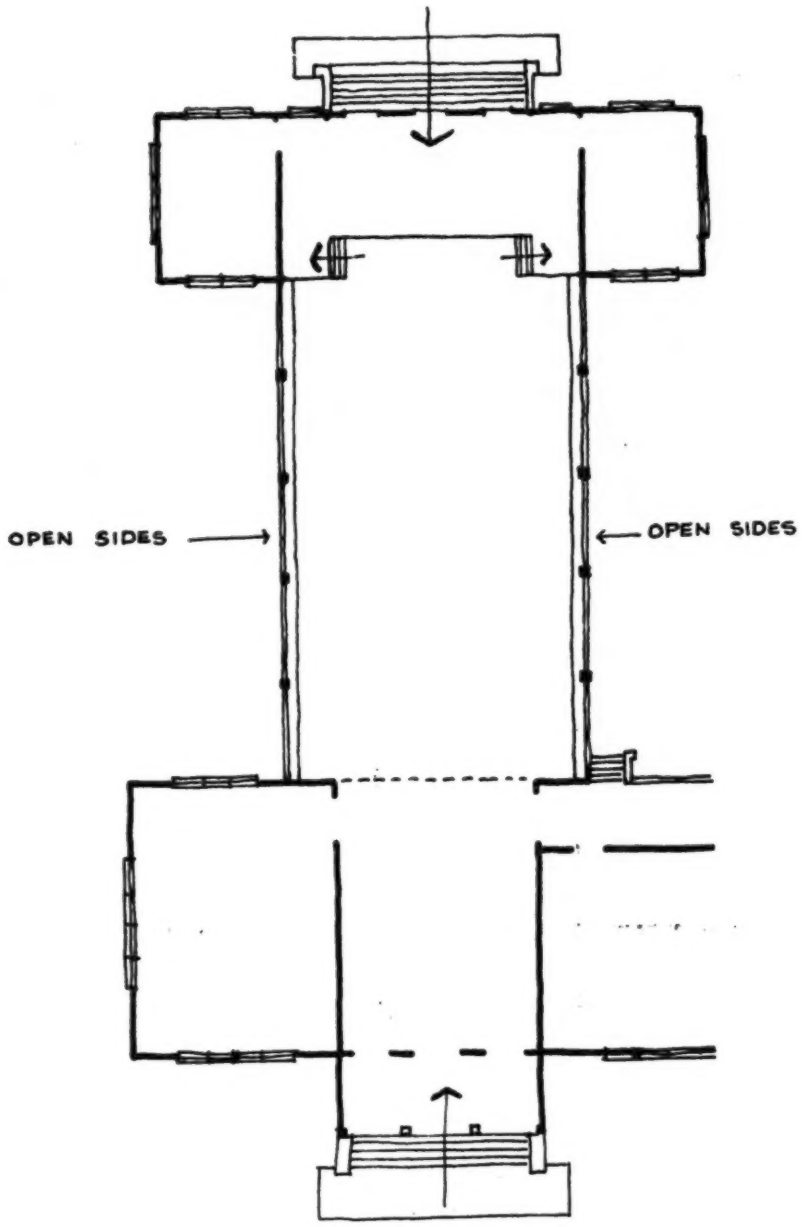
Rhode Island, USA. A combined space suitable for dining and assembly and for community gatherings. It is especially suitable for multi-stream, urban use.

FIGURE 12



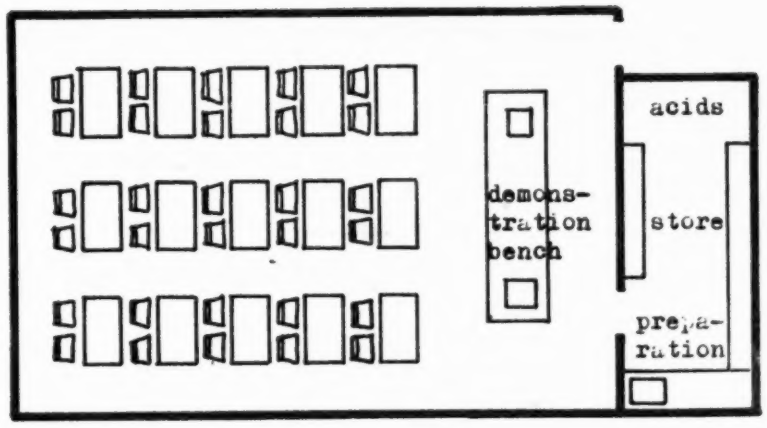
N. Hagerstown High School, U.S.A. A combined theatre, assembly hall and dining hall. This space is also highly suitable for community use after school hours.

FIGURE 13

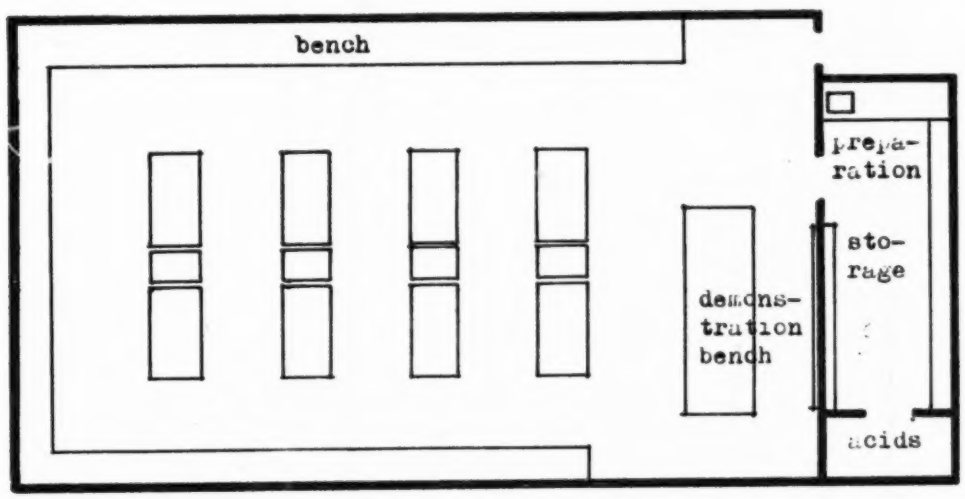


An example of a multi-purpose hall in a Thai, Ministry of Education Standard School. The space is suitable for assembly, drama and dancing as well as for community use in respect of which special entrances have been planned and the sides of the hall left open.

FIGURE 14



a) A laboratory equipped for demonstration only
(students passive)



b) A laboratory furnished for experimental work
(students active)

FIGURE 15

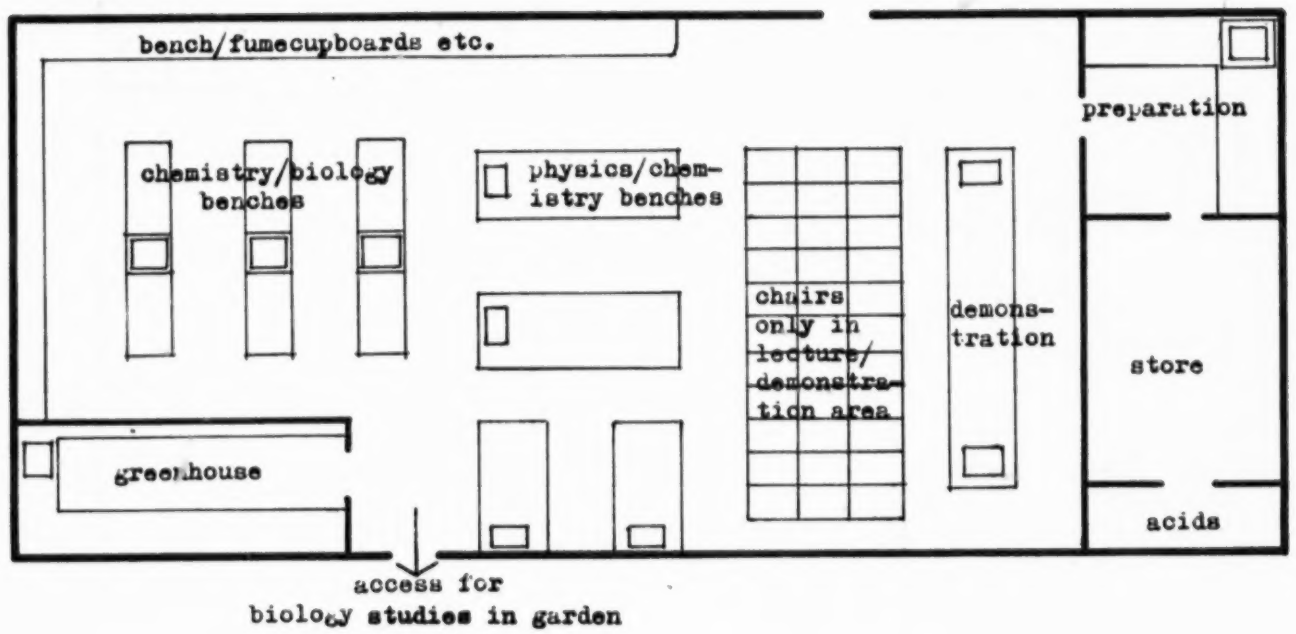
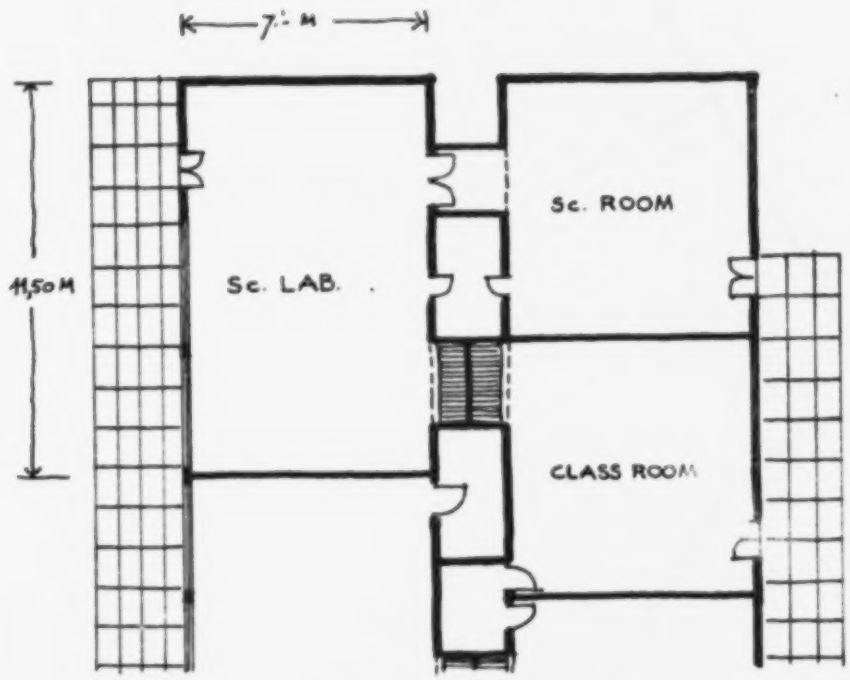


FIGURE 16

Multi-Purpose laboratory for chemistry, biology and physics



This example of a multi-purpose science room from West Pakistan is thoroughly flexible and convenient - allowing of teaching and experiment within two spaces that may be controlled as one.

FIGURE 17

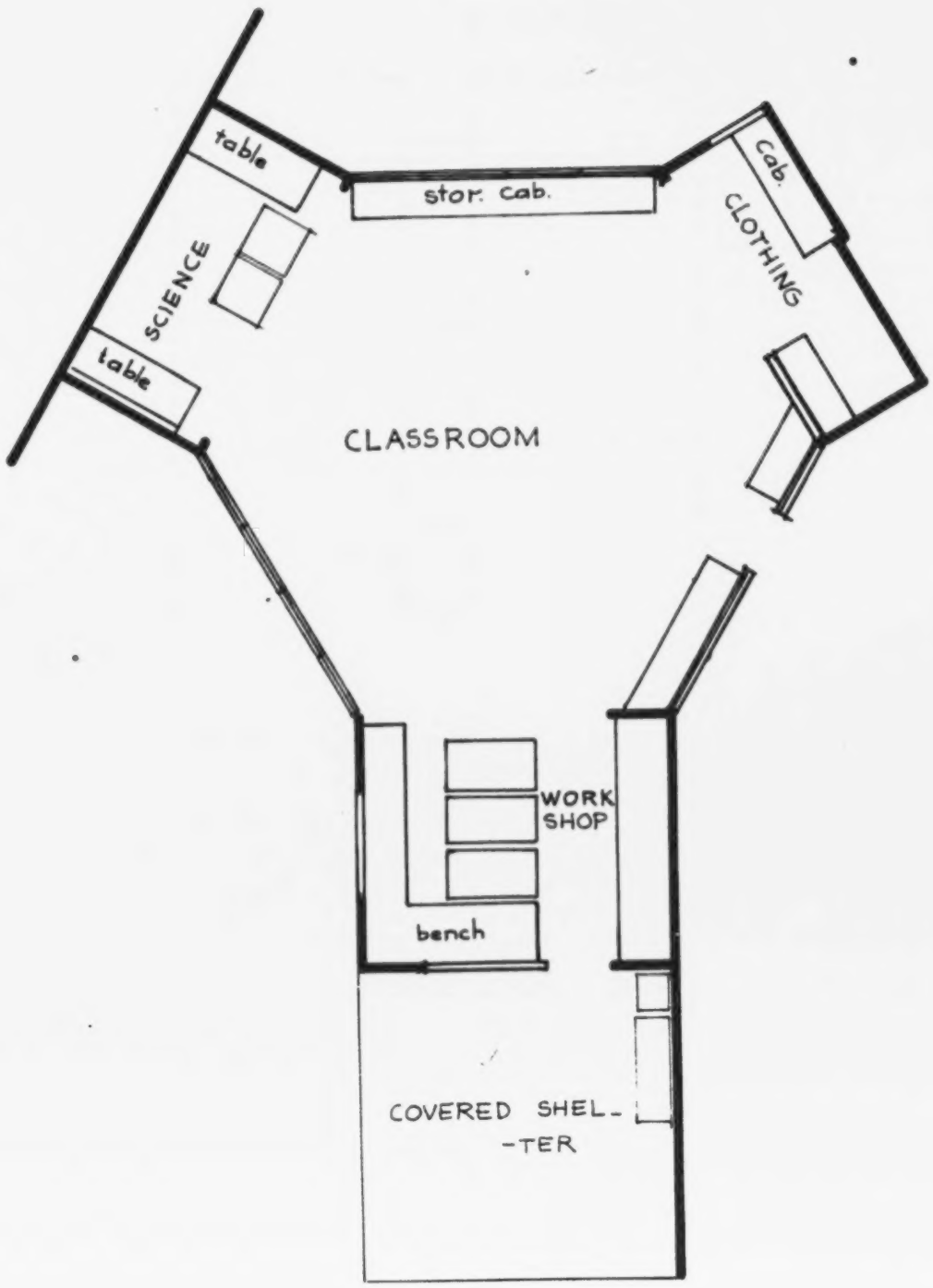


table
stor. cab.
Cab.
CLOTHING
SCIENCE
table
CLASSROOM
WORK
SHOP
bench
COVERED SHEL-
-TER
0 1 2 3 4 5 10 M'

FIGURE 18

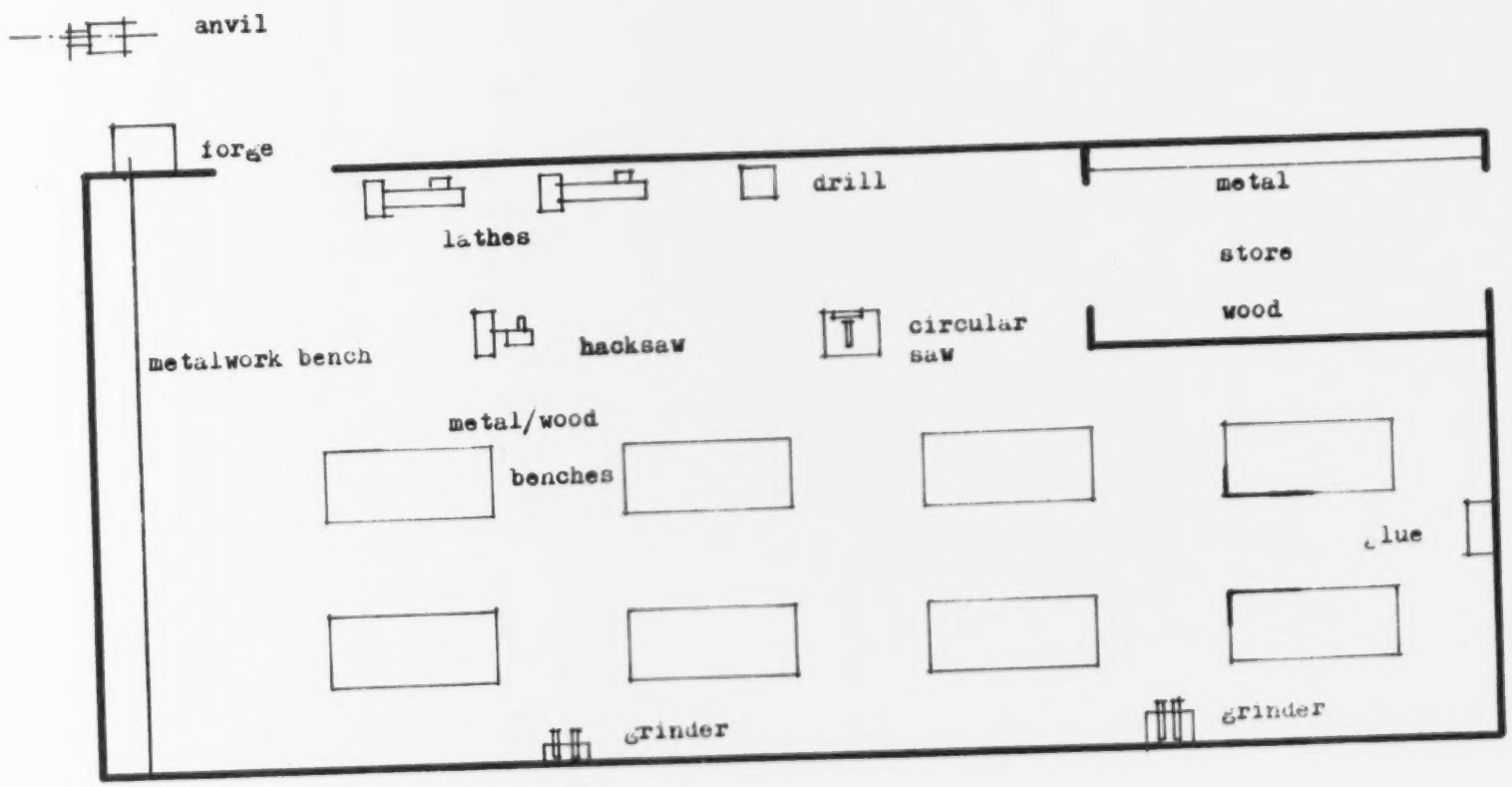
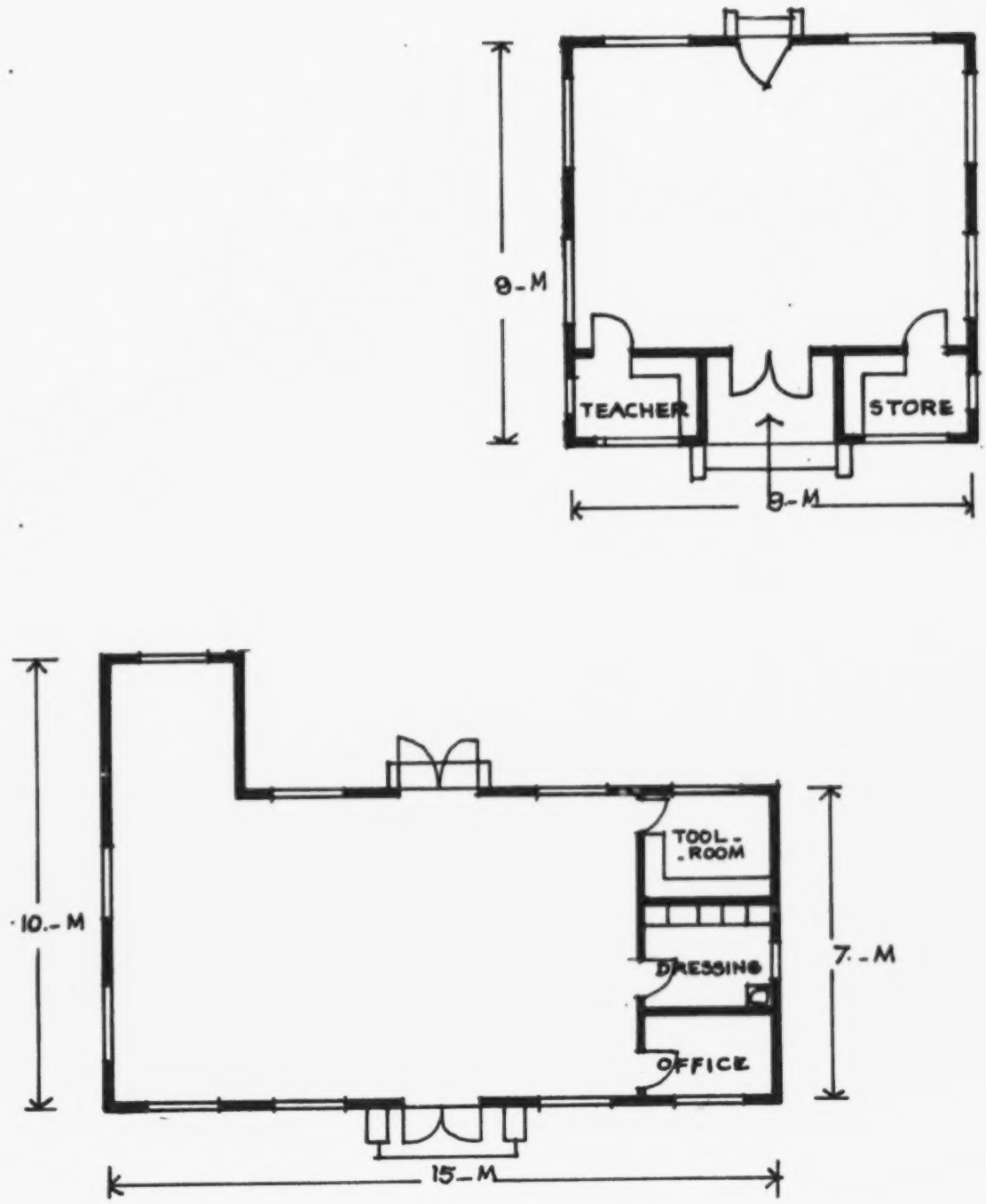


FIGURE 19

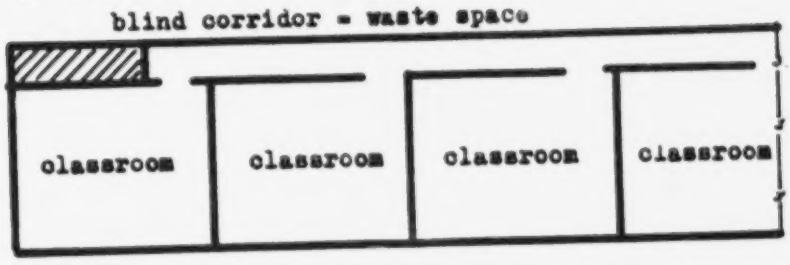
MULTIPURPOSE CRAFT ROOM



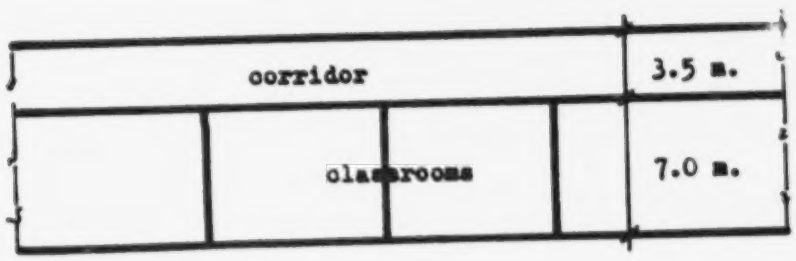
Two Philippines industrial Arts buildings used for combined woodwork - metalwork - handicrafts activities. Both economically planned with minimum waste of space.

FIGURE 20

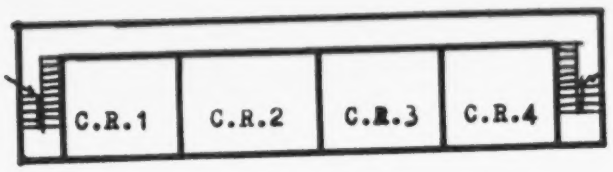
1) The 'blind' corridor



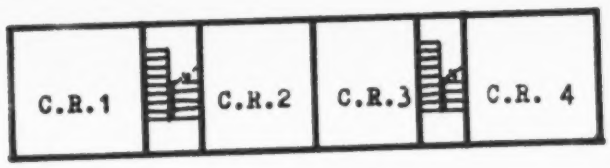
2) The wide corridor



3) Corridors at ground and first floor



two staircases and one corridor
downstairs, one up.



two staircases only
saving cost of 2 long corridors

FIGURE 21